

AFFDL-TM- 79-82-FXN

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IMPROVED PROGRAMS TO TRANSFER DATA FROM A NICOLET 1090 DIGITAL  
OSCILLOSCOPE TO A HEWLETT-PACKARD 9810 CALCULATOR

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This Technical Memorandum has been reviewed and is approved for publication.



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## ABSTRACT

These two programs were written to transfer data from a Nicolet 1090 digital oscilloscope through a Hewlett-Packard 9810 calculator that stores the data on a specially prepared tape cassette. They were written to replace a series of six programs described in AFFDL-TM-77-20 and thus simplify the oscilloscope recording process. Also included are operating instructions for these programs.

## FOREWORD

This report contains the operating instructions and program for transferring data from the 1090 series digital oscilloscope to a 9810 Hewlett-Packard calculator tape cassette. The programs were written by David V. Breitenbecher. The work was performed as part of AFFDL in-house work unit number 24041304, "Development of Thermal and Flow Measurement Techniques," of task number 240413, "Aerodynamic Ground Test Technology" and covers work between August 1978 to November 1978.

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## SECTION I

### INTRODUCTION

This report contains a brief description and instructions for operating two programs written to transfer data from Nicolet 1090 digital oscilloscope through a Hewlett-Packard 9810 calculator that stores the data on a specially prepared tape cassette. These two programs were written to replace a series of six programs described in AFFDL-TM-79-20-FXN and thus simplify the oscilloscope data recording process.

These programs are: Oscilloscope Recording Program - 1978, used to store data from the Nicolet 1090 digital oscilloscope on a tape cassette; and File Marking Program for Tamarak, used to make the storage cassette.

## SECTION II

### DIGITAL OSCILLOSCOPE CASSETTE RECORDING SYSTEM

There are two programs for controlling the flow of data between the Nicolet digital oscilloscope and the H-P tape cassette.

- a. File Marking Program for Tamarak (FMPT).
- b. Oscilloscope Recording Program - 1978 (ORP-78).

The first program is used to make a cassette on which the data from the digital oscilloscope may be stored. See "Instructions for Making Data Storage Cassette". The cassette tape contains the storage buffers for 4096 words from the oscilloscope memory plus storage area for other data as shown in Table 1.

The first program initialized the cassette tape, generates 65 files, each containing 64 registers, and writes the cassette number in the first register of the first file. The first file is also used to store the data shown in Table 1. The next 64 files, containing a total of 6094 words, are used to store oscilloscope memory data.

The second program has five uses for operations: one, List Scope Data, list the data in the first file; two, Change Run Number and Date; three, Record Scope Data, record data into the first file; four, Scope to Cassette, transfer data from the oscilloscope memory to the cassette; five, Cassette to Scope, transfer oscilloscope data from the cassette to the oscilloscope memory.

List Scope Data may be used any time the operator desires to know the contents of the first file. Change Run Number and Date may be used when the

TABLE I

## STORAGE ALLOCATIONS IN THE FIRST FILE

| LOC<br>REG NO. | DATA                                    |
|----------------|-----------------------------------------|
| 0              | File Number/Cassette Number             |
| 1              | Date                                    |
| 2              | Number of Runs/Number of Divisions Used |
| 3              | Sweep Time Per Point Multiplier         |
| 4              | Sweep Multiplier in Seconds             |
| 5              | Number of Channels                      |
| 6              | Voltage Scale in Use                    |
| 7              | Voltage Scale in Use                    |
| 8              | Signal Offset in Volts                  |
| 9              | Signal Offset in Volts                  |
| 10             | Run Number of First Quarter             |
| 11             | Run Number for Next Transfer            |
| 12             | Number of Divisions on Oscilloscope     |
| 13-64          | Not Used                                |

operator wishes to reuse the cassette for new data and it is required to change the run number, date, and/or number of quarters to make the cassette correct. Record Scope Data is used to record scope data on a new cassette or when extensive changes must be made to preused cassette. Scope to Cassette is used to transfer memory data from the oscilloscope to the cassette. Cassette to Scope is used to transfer previously recorded data from a cassette back to the oscilloscope memory.

### SECTION III

#### INSTRUCTIONS FOR MAKING DATA STORAGE CASSETTE

##### I. Software and Hardware Required:

- a. H-P 9810 calculator with the following ROM's:
  - 1. Position 1 - Mathematics Block
  - 2. Position 2 - Peripheral Control
  - 3. Position 3 - Cassette Memory Plotter Printer Alpha
- b. H-P 9865 cassette memory
- c. Tape cassette
- d. Program - File Marking System for Tamarak

##### II. Operating the Program

- a. Turn on 9810
- b. Load program
  - 1. Press: END, CLR, RUN
  - 2. Place program card in calculator
  - 3. Press: LOAD
  - 4. Remove card
- c. Turn on cassette
  - 1. Place tape in cassette
  - 2. Rewind

d. Place files on tape

1. Press: END, CLEAR, CTN

2. Calculator will print and halt

FILE MAKING  
PROGRAM FOR  
TAMARAK

\*\*\*\*\*

3. Enter file number

4. Press: CTN

5. Calculator will print file number, then place remaining files  
on the tape.

6. When these files have been placed on the tape the calculator  
will print:

FILES 1.\*  
THROUGH 65.  
HAVE 64.  
REGISTERS

\*\*\*\*\*

END PROGRAM

e. See Appendix A for print out

## SECTION IV

### INSTRUCTIONS FOR OPERATING OSCILLOSCOPE RECORDING PROGRAM 1978

#### I. Software and Hardware Required:

- a. H-P 9810 calculator with the following ROM's:
  1. Position 1 - Mathematics
  2. Position 2 - Peripheral control
  3. Position 3 - Cassette Memory Plotter Printer Alpha
- b. H-P 9865 cassette memory
- c. Nic 1090 or 1090A digital oscilloscope
- d. Nic 191 digital interface
- e. Data storage cassette
- f. Program: Oscilloscope Recording Program - 1978

#### II. Operating Instructions

- a. Insert programmed data storage cassette into cassette memory.
- b. Connect and turn on calculator, cassette memory, oscilloscope, and digital interface.
- c. Set oscilloscope memory to ALL
- d. Rewind cassette memory
- e. Load program (Oscilloscope Recording Program - 1978)
  1. Press: END, CLR, RUN
  2. Place program card in calculator

3. Press: LOAD
  4. Remove card
- f. Run program
1. Press: END, CLR, CTN
  2. Calculator will print and halt.

```

          OSCILLOSCOPE
          RECORDING
          PROGRAM
          *****
          ,
          OPERATION CODES
          *****

          1..LIST SCOPE
            DATA

          2..CHANGE RUN
            NUMBER AND
            DATE

          3..RECORD SCOPE
            DATA

          4..SCOPE TO
            CASSETTE

          5..CASSETTE TO
            SCOPE
          *****
          ENTER OPERATION
          CODE

```

3. The operator then enters the operation code from above. See Section 2 for explanations of the codes. Go to the instruction for the operation code in Section V.

## SECTION V

### INSTRUCTIONS FOR OPERATION CODES

#### I. List Scope Data

- a. Enter 1
- b. Press CTN
- c. Program will print the following and halt

\*\*\*\*\*

OSCILLOSCOPE  
SETTINGS

\*\*\*\*\*

CASSETTE NO.

24.000

DATE

780921.000

RUN NO.

48.000

RUN NO.

49.000

RUN NO.

50.000

RUN NO.

51.000

MEMORY SIZE

1024.000

MEMORY DIVISIONS

4.000

SWEEP TIME SEC.

MULTIPLIER

0.500

```

MAGNITUDE
      -5.000
NO. OF CHANNELS
      2.000
VOLTAGE SCALE
      10.000
VOLTS
OFFSET
      0.000
VOLTS
*****
ENTER OPERATION
CODE
      1.0*
*****

```

- d. At this time the program is ready for another operation code.
- e. See Appendix B for sample print out.

## II. Change Run Number and Date

- a. Enter 2
- b. Press CTN
- c. Program will print the following and halt

```

*****
DATE YYMMDD..→*

```

- d. Enter date (year, year, month, month, day, day)
- e. Press CTN
- f. Program will print the following and halt

NO. OF RUNS

- g. Enter number of runs
- h. Press: CTN
- i. Program will print the following and halt

RUN NO. OF  
FIRST QUARTER →X

- j. Enter run number of first quarter or first half
- k. Press: CNT
- l. Program will print the following and halt

\*\*\*\*\*

ENTER OPERATION  
CODE

\*\*\*\*\*

- m. At this point the program is ready for another operation code.
- n. See Index C for sample print out

### III. Record Scope Data

- a. Enter 3
- b. Press CTN
- c. Program will print the following and halt

\*\*\*\*\*

NO. OF DIVISIONS  
ON SCOPE

- d. Enter data, press CTN

e. Program will print the following and halt

\*\*\*\*\*

NO. OF DIVISION  
USED

f. Enter data, press CTN

g. Program will print the following and halt

\*\*\*\*\*

SWEEP TIME PER  
POINT  
MULTIPLIER

h. Enter data, press CTN

i. Program will print the following and halt

ORDER OF  
MAGNITUDE  
IN SECONDS

j. Enter data, press CTN

k. Program will print the following and halt

\*\*\*\*\*

VOLTAGE SCALE  
IN USE

l. Enter data, press CTN

m. Program will print the following and halt.

\*\*\*\*\*

SIGNAL OFFSET  
IN VOLTS

n. Enter data, press CTN

- o. Program will print the following and halt

\*\*\*\*\*

ENTER OPERATION

CODE

- p. At this point the program is ready for another operation code

- q. See Appendix D for sample print out

#### IV. Scope to Cassette Transfer

- a. Enter 4

- b. Press CTN

- c. Program will transfer the data from the oscilloscope to the cassette.

- d. Upon completion of the transfer the program will print the following and halt.

\*\*\*\*\*

SCOPE→CASSETTE

TRANSFER

CONCLUDED

\*\*\*\*\*

ENTER OPERATION

CODE

- e. At this time the program is ready for another operation code.

- f. See Appendix E for sample print out.

#### V. Cassette to Scope Transfer

- a. Enter 5

- b. Press CTN

- c. Program will transfer data from the cassette to the oscilloscope.
- d. Upon completion of the transfer the program will print the following and halt.

\*\*\*\*\*

CASSETTE→SCOPE

TRANSFER

\*\*\*\*\*

ENTER OPERATION

CODE

- e. At this time the program is ready for another operation code.
- f. See Appendix F for sample print out.

APPENDIX A

\*\*\*\*\*

FILE MAKING  
PROGRAM FOR  
TAMARAK

\*\*\*\*\*

ENTER FILE NO.→X  
25.\*

\*\*\*\*\*

FILES 1.\*  
THROUGH 65.  
HAVE 64.

REGISTERS

\*\*\*\*\*

END PROGRAM

\*\*\*\*\*

APPENDIX B

ENTER OPERATION

CODE

1.0\*

\*\*\*\*\*

OSCILLOSCOPE

SETTINGS

\*\*\*\*\*

CASSETTE NO.

25.000

DATE

780921.000

RUN NO.

48.000

RUN NO.

49.000

RUN NO.

50.000

RUN NO.

51.000

MEMORY SIZE

1024.000

MEMORY DIVISIONS

4.000

SWEEP TIME SEC.

MULTIPLIER

0.500

MAGNITUDE

-5.000

NO OF CHANNELS

2.000

VOLTAGE SCALE

10.000

VOLTS

OFFSET

0.000

VOLTS

APPENDIX C

ENTER OPERATION  
CODE

2.000\*

\*\*\*\*\*

DATE YYMMDD..→\*

780921.0\*

NO. OF RUNS

4.0\*

RUN NO. OF

FIRST QUARTER →X

48.0\*

## APPENDIX D

ENTER OPERATION  
CODE

3.000\*

\*\*\*\*\*

NO. OF DIVISION  
ON SCOPE

4.000\*

\*\*\*\*\*

SWEEP TIME PER  
POINT

MULTIPLIER

0.500\*

ORDER OF  
MAGNITUDE  
IN SECONDS

-5.000\*

\*\*\*\*\*

VOLTAGE SCALE  
IN USE

10.000\*

\*\*\*\*\*

SIGNAL OFFSET

## APPENDIX E

ENTER OPERATION  
CODE

4.\*

\*\*\*\*\*

SCOPE→CASSETTE  
TRANSFER  
CONCLUDED

## APPENDIX F

ENTER OPERATION  
CODE

5.\*

\*\*\*\*\*

CASSETTE→SCOPE  
TRANSFER  
CONCLUDED